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OSHA'S PROPOSED RULE ON INDOOR AIR QUALITY (IAQ) IN WORK ENVIRONMENTS

OSHA'S PROPOSED RULE ON IAQ RECOGNIZES THE IMPORTANCE OF THE PROPER DESIGN, MAINTENANCE, AND OPERATION OF A BUILDING'S HEATING, VENTILATION AND AIR CONDITIONING (HVAC) SYSTEM; THE PROPOSED RULE, HOWEVER, FALLS SHORT OF PROVIDING A COMPREHENSIVE APPROACH TO WORKPLACE IAQ; OSHA FAILS TO ADEQUATELY SUPPORT ITS OWN PROPOSED RULE AND FAILS TO DEMONSTRATE A SIGNIFICANT RISK OF MATERIAL IMPAIRMENT FROM IAQ

OSHA's Proposed Rule on indoor air quality (59 Fed Reg. 15968) is based upon the following contentions:

(1) **Indoor air quality problems are most often associated with inadequate ventilation system performance.** The Proposed Rule states: "A common theme that runs through the literature and the OSHA docket indicates that the principal factor associated with indoor air quality complaints is inadequate ventilation." (59 Fed Reg. 16010);

(2) **Complaints regarding unacceptable indoor air quality (usually associated with symptoms of irritation, annoyance and discomfort) cannot, as a rule, be traced directly to specific airborne substances or to specific levels of exposure.** The Proposed Rule states: ". . . air quality complaints usually have some basis, although they are often difficult to assess with

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specificity . . . [complaints] are not easily traced to a specific substance, but are perceived as resulting from some unidentified contaminant or combination of contaminants." (59 Fed Reg. 15969);

(3) **Remediation and mitigation of poor indoor air quality, and the attainment and maintenance of acceptable indoor air quality, depend upon the correct design, operation and maintenance of a buildings' ventilation system.** The Proposed Rule states: (a) "Symptoms . . . may be reduced or eliminated by modifying the ventilation system." (59 Fed Reg. 15970); (b) "The outside air ventilation rate of the building affects indoor air quality. It determines the extent to which contaminants are diluted and removed from the indoor environment." (59 Fed Reg. 16003); (c) [Sick-building investigations report] "the lack of outside ventilation air resulting from operational or maintenance deficiencies as one of the causes of IAQ complaints. Many of the studies include abatement recommendations to ventilate with outside air as feasible per the original design intent . . . research projects . . . also support the case for ventilating buildings with at least the recommended minimum of outside air . . . ." (59 Fed Reg. 16027)

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1. Inadequate Ventilation is Associated with Approximately One-Half of All Complaints in Sick-Building Investigations

A number of summaries and databases of "sick-building" investigations were submitted to the OSHA RFI docket on Indoor Air Quality (1991). With one exception, the Proposed Rule fails to reference or discuss any of them. One of the most notable compilations of sick-building investigations was undertaken by NIOSH, referenced in the OSHA Proposed Rule at 59 Fed Reg. 16003 and 16010. Inadequate ventilation was identified as a primary problem in fifty-two percent of the 484 building investigations in the NIOSH database.[1, 2] Inside contamination was identifiable in only fifteen percent of all buildings; microbiological contaminants were identified in five percent.

Other building investigation databases that were neither referenced nor discussed in the Proposed Rule report similar results. For example, a database of 1,362 building investigations has been compiled by Health and Welfare Canada.[3, 4] Inadequate ventilation was identified as the primary problem in 52 percent of the buildings investigated. Specific indoor air contaminants were identified in only twelve percent of the investigations. (TDSA, 3-1073; PM, 3-1074)

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Public Works Canada, another Canadian federal agency, investigated 30 buildings for IAQ complaints between 1987 and 1990.[5] Ventilation-related problems were reported in one-half of the buildings. (TDSA, 3-1073)

TDSA Ltd. have compiled data on 408 building investigations conducted in the U.S. and Canada. The results have been analyzed and computerized in what is called the "Building Performance Database." Ventilation-related inadequacies were directly associated with IAQ complaints in forty-nine percent of the buildings catalogued in the Database.[6] (TDSA, 3-1073)

A private, U.S.-based IAQ monitoring firm conducted 412 building investigations from 1981 through 1988. Ventilation problems were associated with complaints in sixty-two percent of the buildings investigated; bacterial and fungal contamination was reported in nearly a third of all buildings investigated. (HBI, 3-1053)

A 1989 report by Dr. James Woods assessed 30 cases of "problem buildings" investigated by the Honeywell Corporation since 1986. Woods' research indicates that 75 percent of the buildings investigated had inadequate outdoor supply air intake. Similarly, 75 percent of the buildings exhibited inadequate air distribution

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to occupied spaces, and 65 percent of the buildings suffered from inadequate HVAC maintenance.[7] (Woods, 3-745; PM, 3-1074)

Kim (1990) summarized 105 investigations of problem buildings undertaken by Clayton Environmental Consultants, a IAQ monitoring firm in the U.S.[8] (Morey, 3-505) She wrote:

> In a survey of 105 buildings, Clayton found that 53 percent had [HVAC] maintenance problems, 49 percent had operational problems (such as improper handling of control equipment), and 33 percent had design problems. Mechanical engineers evaluated the HVAC systems in 70 of the buildings, in which they found that 75 percent had maintenance problems, 70 percent had operational problems, and 47 percent had design problems. Of the 105 buildings, 95 were sampled for contaminants. Of these, 28 were found to have problem levels of microbial contaminants, 26 had volatile organic compounds and 13 combustion products. (PM 3-1074)

Freund, et al., from the New Jersey Department of Health evaluated 221 complaint buildings in that state and reported that 43 percent were associated with inadequate ventilation.[9] (HBI, 3-1053).

The Oregon Department of Resources submitted results of 36 state office building investigations to the OSHA RFI docket (3-1157). The respondents observed:

> Thirty-six state office buildings were examined for IAQ problems. Significant

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> problems were found in 16 buildings. Many of the problems were associated with inadequate ventilation and high levels of carbon dioxide . . . studies in Oregon have shown that when outside make-up air falls below 15 cfm, complaints increase.

In a submission to the OSHA docket by Local 12/Occupational Illness Support Group of the U.S. Department of Labor, the authors report that:

> Inadequate ventilation is the primary cause of most of the indoor air quality problems . . . . This is a result of the Department's inability to maintain adequate amounts of outside air . . . . (3-1017)

Thus, published data from a number of building investigation databases submitted to the OSHA RFI reveal that deficiencies in ventilation have been directly related to IAQ complaints in approximately one-half or more of all reported cases. HVAC-related problems have been associated with complaints in as many as 75 percent of the sick-building investigations discussed above.

2a. IAQ Complaints Generally Cannot be Associated With Specific Substances

Although the Proposed Rule correctly contends that correlations between specific complaints and specific substance exposures in indoor air quality investigations are rare, it fails to cite relevant support from the OSHA RFI docket. (59 Fed Reg.

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15969). A number of comments submitted to the docket substantiate that claim. For example, the Atlantic Richfield Company (ARCO) reports that, in their experience, "when monitoring has been conducted, hazardous contaminants have either not been detected, or they are present in concentrations far below those known to present health hazards." (ARCO, 3-448)

The submission from Organization Resources Counselors states that:

> Companies report monitoring for formaldehyde, total and respirable particulates, total organics. . . . In almost all cases where monitoring was done for specific contaminants, results were either below the level of detection, or were below OSHA Permissible Exposure Limits. (3-1084)

Similarly, CanTox, Inc. reports that:

> More than half (63 percent) of the compounds detected in indoor air could not be attributed to a definite source. The largest group with known sources were found to have multiple sources and their presence could not be exclusively attributed to one specific source. This clearly has significant implications with respect to attempting to use source control to maintain indoor air quality. (3-1180)

The American Federation of Government Employees (AFGE) of the AFL-CIO reports that "unfortunately, despite the substantial evidence linking poor indoor air quality to AFGE members' adverse health effects, AFGE is unable to obtain the data needed to make

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the causal connection between specific contaminants and those adverse health effects." (3-529)

United Technologies reports that, "based on our experience in occupational settings and knowledge of the professional literature, there are only very weak data that directly relate specific chemicals to IAQ." (3-651)

TDSA Ltd., after citing four studies, report that:

> The correlation between symptoms presented in IAQ complaints and causative agents is weak because exposure to many different types of contaminants in indoor air, originating from both indoor and outdoor sources, has been shown to result in similar health and comfort complaints. The presence of pollutants in indoor air, combined with thermal comfort parameters of temperature and humidity, and other building characteristics, such as ventilation, lighting, noise and occupant density and activities, make it difficult to isolate the causative agent in IAQ-related health and comfort complaints. (3-1073)

The American Industrial Hygiene Association (AIHA) notes that, based on their experience:

> In most IAQ complaints, symptoms are non-specific and could be caused by a variety of factors. Correlations can be found where there is a consistent spacial and temporal relationship and the complaint can be resolved by changing the building condition. Biological contamination may sometimes be distinguished by a pattern of allergy symptoms. (3-735)

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The Building Performance Database compiled by T.D. Sterling and Associates Ltd. provides data on airborne substance monitoring from over 200 sick-building investigations. Average recorded levels of carbon dioxide, carbon monoxide, respirable suspended particles, formaldehyde, airborne fungi and bacteria, nicotine, temperature and humidity are all within parameters of "acceptable" exposure. Nevertheless, the buildings from which the monitoring results arose were deemed "sick." The authors conclude: "In general, IAQ investigations of white collar workplaces have found indoor concentrations of measured substances far below occupational exposure levels. . . ." (TDSA, 3-1073)

2b. The Sick-Building Databases Submitted to the OSHA RFI Docket Indicate That ETS is Associated With Complaints in Only Two to Five Percent of All Investigations; The Data Do Not Support OSHA's Attempt to Separate ETS from General IAQ Issues

The OSHA Proposed Rule conspicuously omits any discussion of ETS within the context of its discussion on IAQ and the identification of specific causes in sick-building investigations. The major databases on sick-building syndrome submitted to the OSHA RFI docket indicate that tobacco smoke is rarely the underlying cause of complaints about poor indoor air quality.[1, 3, 6] For example, in HBI's database of 412 sick-buildings, ETS was reported to be a significant contributor to complaints in only 3 percent of all buildings investigated. (HBI, 3-1053) In the sick-building

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3. Ventilation: The Mitigation Procedure for Poor IAQ

The data on ETS discussed above are derived from the same databases that support OSHA's contention regarding the primary cause of complaints about indoor air quality, namely, inadequate ventilation. The Proposed Rule correctly recognizes that the appropriate mitigation procedure for complaints focuses on ventilation and specifically on adequate supply air, its distribution to occupied spaces and the proper maintenance of HVAC systems. The RFI docket is replete with such recommendations. For example, the New York State Building and Construction Trades Council reports that, based on their experience, "the average office setting exposes workers to contaminants from machines, carpets, paints, glues, and fungi. These contaminants mix with the air the workers breathe on a daily basis and affect a person's well-being. Proper ventilation has been shown to provide a proven antidote to these problems." (3-732)

IAQ investigators from AFSCME Local 12 from the University of Iowa Employees Union report that "we have found that insufficient fresh air flow is most often the cause of a number of symptoms, including coughing, skin and eye irritations, headaches and upper respiratory infections . . . indoor air quality problems can be treated with little effort and expense by improving or

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upgrading inadequate ventilation systems to increase fresh air flow in the workplace." (3-809)

Investigators from CanTox Inc. agree: "[C]ontrol of the air exchange rate (i.e., ventilation) of a building is probably the most important and practical mediation practice for management of indoor air quality." (3-1180)

The State of New Jersey Health Department's investigation of 221 complaint buildings revealed that over 43 percent of all cases involved inadequate ventilation.[9] In cases where abatement recommendations were made, the recommended strategy consisted of increased maintenance, repair, adjustment or redesign of the HVAC system. Eighty-four percent of the cases where such abatement steps were implemented reported the elimination of complaints. (HBI, 3-1053)

Indoor air quality in schools has recently become an issue of considerable concern. In 1989, Helsing and co-workers reported the results of an IAQ investigation in a school.[10] They reported that "there was an insufficient fresh air supply to some classrooms and a large percentage of students exhibited classic symptoms of sick-building syndrome, i.e., headache, eye burning, fatigue." Similarly, investigations by Hanssen (1987)[11] and Beller (1989)[12] reported that low air exchange rates in combination with

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installation of new building materials were the main cause of complaints in the schools that they investigated. Helsing, et al. concluded: "Correcting the ventilation problems resulted in reduction of symptoms to a level approximately equal to that of students in other schools in the county."[10] (PM, 3-1074)

In 1989, Collett and Sterling examined the effect of ventilation retrofits on perceived health and comfort complaints by building occupants. For the buildings in which major retrofits were undertaken, perceptions of indoor air quality improved in seven of nine categories surveyed. (TDSA, 3-1073)

Similarly, Canadian health officials who investigated and compiled the Canadian sick-building database (Health and Welfare Canada) observed that recommendations for improvements in ventilation and thermal comfort had been made in 60 percent of the buildings 1,400 investigated, while control of specific pollutants was recommended in only 20 percent of all cases.[13] (PM, 3-1074)

In 1984, a committee on sick-building syndrome from the WHO's Europe Working Group on Indoor Air Research concluded that an increase in outdoor supply rates, together with improvements in air distribution, had satisfactory results in remediating sick-building syndrome. (Lebowitz, 3-188)

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The Ohio Civil Service Employees Association, after reviewing three indoor air quality incidents in Ohio, endorsed the ventilation approach "as a vital component in solving and preventing persistent health and safety problems related to indoor air in the workplace."; (3-398)

Steven B. Hayward of the State of California Department of Health Services recommends adoption of a minimum ventilation standard similar to that currently in effect as a Cal/OSHA regulation. The Cal/OSHA standard requires that a minimum supply of outdoor air specified in the State Building Standard Code be provided, and that the HVAC system be operated continuously, inspected regularly, and properly maintained. (3-17A)

Respondents to the RFI also observe that adequate ventilation is the preferred method for controlling exposures to radon, VOCs, CO, CO_2, bioaerosols and ETS. (Eagle EH., 3-500; Burge, 3-61; HBI, 3-1053) Indeed, the U.S. Department of Labor's own Occupational Illness Support Group states that ETS and radon "have seldom been the source of employee complaints of poor indoor air quality. With properly designed and properly operated ventilation systems, exposure to radon and passive smoke can be minimized." (3-1017)

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4. OSHA's Proposed Rule Fails To Address Other Environmental Variables Unrelated To IAQ That Play A Role In Worker Complaints About Health And Comfort

The Proposed Rule dismisses the possibility that factors unrelated to IAQ, e.g., temperature, lighting, stress, workload, etc., may play a role in worker perception about IAQ. OSHA discounts the potential psychological element in worker complaints by arguing that complaints "are unlikely to be due to mass psychogenic illness . . ." 59 Fed Reg. 15970. OSHA misses the point. A number of studies in the published literature that were submitted to the RFI docket indicate that lighting, temperature, humidity, job satisfaction, job stress and ergonomics are factors that influence worker perceptions about IAQ. (TDSA, 3-1073) For example, in a SBS study in Denmark, Skov and colleagues examined sick-building syndrome reports among 4,369 office workers. Their research indicated that indoor climate perception was strongly related to the prevalence of SBS symptoms. Lifestyle factors were only weakly associated with the reporting of symptoms.[14] (PM, 3-1074)

A 1991 report by Hawkins and Wang ranked a number of variables related to self-reported symptoms of sick-building syndrome.[15] Those variables included: "humidity," "satisfaction with work," "active smoking," "gender," "exposure to ETS," "office light," and "doing professional work." They concluded:

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> Building Sickness Score was associated with many factors. Sick building syndrome symptoms are influenced by multiple variables of which the environmental factor of humidity and the psychological factors of work, sex, and occupation are important. (PM, 3-1074)

Based on one of his own studies, Hedge reports that although ventilation has an important effect on indoor air quality, reports from workers in 46 office buildings in the U.K. indicate that complaints are even more strongly influenced by a number of personal and occupational factors such as gender, job stress, job satisfaction and computer use. (3-955)

The American Industrial Hygiene Association (AIHA) reports that "psychosocial and physical stresses are certainly potential causes of some IAQ complaints and should always be considered in any investigation." This opinion is based on the experience of AIHA members. (3-735)

Citing two studies, Eagle Environmental Health reports that "thermal discomfort, unpleasant odors, lack of air movement, insufficient lighting, and excessive noise are also indicated in IAQ investigations. Job-related stress many also manifest itself in IAQ complaints." (3-500)

The National Energy Management Institute (NEMI) reports:

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> The NEMI experience has revealed that there are a variety of factors which can interact to cause a worker to display indoor environmental health-related problems. These factors may actually be the primary cause or may exacerbate an IAQ problem condition. Temperature, temperature change, humidity, air velocity, light levels, noise as well as psycho-social factors should <u>always</u> be considered in presenting and investigating IAQ problems. (3-1183)

Even the U.S. EPA recognizes that factors related to SBS are multi-factorial, involving combined environmental and psycho-social stressors. (3-1075; Attachment H) Citing the World Health Organization (1986), the EPA notes:

> Buildings at highest risk [of SBS] appear to be new or recently remodeled buildings with tight envelopes, especially those with large ventilation systems that depend on limited fresh air sources. Improper ventilation, thermal conditions, and occupant lack of control over climatic and working conditions are other factors that may increase the likelihood of a building being linked to sick-building syndrome. (3-1075; Attachment E)

A NIOSH psychologist, Dr. Michael Colligan, has offered an explanation for the role of such factors in perceptions about IAQ.[16] (PM, 3-1074) He writes:

> It appears then, that the individual is sensitive to fluctuations in the functioning of the autonomic nervous system. When perceived changes in his subjective state are understandable, e.g., 'I have an allergy,' 'I've been under a lot of pressure to met a deadline,' 'I'm worried about my teenager,' an individual can initiate various coping

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> strategies to deal with the causes. When the origins of the experienced distress are vague or unclear, however, an individual starts searching around for salient cues. If the environment provides a plausible cause in the form of a pungent odor or dense, stuffy air, then an individual can conclude, rightly or wrongly, that the poor quality of the environment is responsible for his physical and psychological discomfort. Notice that this process can occur independently of any specific toxic effects the environment might have on the individual and irrespective of the 'real' cause of the autonomic arousal. All that is required is that individual experience autonomic arousal in response to a subtle or unidentified stressor or combination of stressors. Cues provided by the environment in the form of noxious odors, visually detectable particulates or dust, or humid, stuffy air, may suggest to an individual that his discomfort is a toxic response to an airborne pollutant. That environment then becomes a source of threat to the individual, which in turn may generate more autonomic arousal and anxiety.

Dr. Colligan's observations provide an understanding of complaints related to ETS in the workplace. Because it is readily identifiable, ETS is often <u>initially</u> blamed for IAQ problems (yet after investigation, reported exposures to ETS are directly associated with complaints in only 2-5 percent of sick-buildings). If individuals are "stressed" by their work environment (influenced by such diverse factors as temperature, humidity, air movement, ergonomics, workload, personal problems, etc.), the mere visibility of ETS may provide a cue for a complaint. Recent research by Winneke and colleagues indicates that an individual with a dislike of ETS will more readily, under actual exposure conditions, respond

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with annoyance symptoms.[17] (PM, 3-1074) Researchers from the Illinois Institute of Technology also addressed the issue of nonsmoker perception of annoyance and irritation from ETS exposures. The study, involving over 250 subjects, reported that visual contact with a smoker increases the magnitude of adverse response to ETS among selected nonsmokers. The authors suggest that their conclusion "provides an inexpensive strategy of reducing complaints associated with ETS: eliminate visual contact between smokers and nonsmokers." (IIT, 3-31)

Precise quantitation of psychological variables and perceptions of comfort within the context of complaints about IAQ is extremely difficult. Nevertheless, the influence of those environmental variables upon IAQ complaints must be recognized and considered in a comprehensive approach to IAQ.

5. OSHA's Proposed Rule Does Not Establish A Significant Risk Of Material Impairment From IAQ Problems In The Nonindustrial Workplace; Data Are Available To Establish Significant Risk From SBS And BRI In The Workplace, But The Proposed Rule Does Not Reference Or Document Representative Examples

Despite a number of submissions to the OSHA RFI docket on IAQ that document specific examples and studies on sick-building syndrome (SBS) and building-related illness (BRI) (e.g., 3-500, 3-933, 3-955, 3-1053, 3-1054, 3-1073, 3-1074, 3-1183, 3-1185), the

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Proposed Rule provides only a cursory examination of the available data. 59 Fed Reg. 15970-73. Specific case reports document hundreds of instances of BRI and SBS that often result in occupant deaths or debilitating illnesses. A sample of those buildings is summarized in Table I. The 351 specific cases of SBS/BRI were not in any way associated with ETS; in many of the buildings, smoking was prohibited altogether.

Studies and reports of SBS and BRI document thousands of cases of specific diseases and illnesses, yet OSHA only acknowledges the possibility of such instances and chooses, instead, to provide a theoretical, quantitative model that estimates the risk of headaches and upper respiratory symptoms from poor IAQ. 59 Fed Reg. 15997. The model does not include instances of death and serious illness due to poor IAQ. OSHA's model projects potential cases of dry eyes, stuffy nose and headache, but it does not satisfactorily demonstrate a significant risk of material impairment from IAQ. Specific instances of mortality and morbidity due to poor IAQ in the nonindustrial workplace, on the other hand, are available (and were made available to OSHA's RFI docket on IAQ). OSHA has not presented the "best available evidence" to support its own position on IAQ.

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TABLE I

Sick-Buildings/Building-Related Illnesses

No.	State	City	Diagnosis	Date	Building	Comment
1.	AK	Anchorage	SBS	1990	State Office Building (Henley v. Blomfeld Co.)	Carpet/HVAC; case settled.
2.	AK		BRI	1992	Indoor skating rink	Freon leak and inadequate ventilation; one death, 33 injuries.
3.	AL	Enterprise	SBS	1993	Coffee County Department of Human Resources	Rainwater seeped into walls, developing mold and mildew. Allergic responses from nearly all 37 employees. In spite of repairs -- building still causing health problems.
4.	AZ	Globe	SBS	1993	Gila County Sheriff's Building	15 people hospitalized. Suspect air-conditioning system drawing in bacteria from old carpeting.
5.	AZ	Phoenix	SBS	1993	Corporation Commission	
6.	AZ	Phoenix	SBS	1993	Department of Economic Security	Unusual odor; burning eyes, sore throats, rashes, lethargy. Chemical used in microfilm duplication machine. (2-pheynl-2-imidiazoline). Plan to clean air conditioning duct work.
7.	AZ	Tucson	SBS	1988	Amelia Maldonado Elementary School	Sewer gases; carbon dioxide, chlorine, pollens, spores, other allergens; school eventually closed.
8.	CA	Anaheim	SBS	1990	Pacific Volt	
9.	CA	Anaheim	Legion	1992	Western Medical Center	Emergency room staff members have disease; testing underway.
10.	CA	Beverly Hills	SBS	1992	The Beverly Plaza Hotel	Formaldehyde; other chemicals.
11.	CA	Burbank	SBS	1989	Lockheed Corp.	440 OSHA violations; 88 suing.
12.	CA	Chino	SBS	1990	California Institution for Men	Workers Comp Claims; 50% of employees affected; cause unknown.
13.	CA	Duarte	Legion	1986	City of Hope Medical Center	Cooling System.
14.	CA	El Segundo	SBS	1985	El Segundo Airport Towers, Building C (Call v. Prudential)	Renovation; poor ventilation. Case settled during trial.
15.	CA	El Segundo	SBS	1993	Phoenix Computer Corporation	General allergic reactions from new carpets, furniture and paint. HVAC system leaked. A large settlement was received by 40 employees.
16.	CA	Goleta	SBS	1988	Raytheon Co. (Buckley)	Synthetics, carpet glue, plastic partitions; settled for $625,000.

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17.	CA	Hayward	BRI	1982	Helen Turner Child Care Center	Chemicals from new roof; plaintiffs won class action suit against school, contractor and chemical manufacturer.
18.	CA	Jackson	SBS	1991	Amador County Courthouse, District Attorneys Office	Possible ventilation problem; building newly renovated.
19.	CA	Los Angeles	Legion	1988	UCLA Medical Center	8 infected; hot water system.
20.	CA	Los Angeles	Legion	1988	Westwood Horizons residential facility	4 deaths; air conditioning unit.
21.	CA	Los Angeles	SBS	1992	Pierce College library	Dirty ventilation ducts; HVAC hadn't been cleaned for 35 years; found dead animals, among other things, in ducts.
22.	CA	Oakland	SBS	1991	Merritt-Peralta Medical Center	Test results pending; employees report hair loss.
23.	CA	Oakland	BRI	1991	Alameda County Court House	Earthquake repairs; chemical fumes.
24.	CA	Poway	SBS	1988	Midland Elementary School	Mold; general unsanitary conditions; students with allergies; tests inconclusive.
25.	CA	Richmond	Legion	1990	Social Security Administration	Basement sink, 2 of 5 cooling towers; 3 lawsuits filed.
26.	CA	Richmond	Legion	1991	Richmond Health Center	Test results pending.
27.	CA	Riverside	SBS	1992	Riverside County Courthouse	Recently renovated; 15 ill.
28.	CA	Sacramento	SBS	1982	Bateson Building (State Office Building)	Off-gassing from carpets and furnishings; building opened in 1981.
29.	CA	Sacramento	SBS, Legion	1991	Twin Towers -- State Office Buildings CA Depts. of Health Services & Social Services	Leaks in buildings; dirty vents; poor ventilation; employee testified before Congress on IAQ.
30.	CA	Sacramento	BRI	1993	Twin Towers State Offices	Respiratory problems and chronic fatigue. 17 cases confirmed. CDC was asked to investigate. Changes to ventilation system. Poor maintenance of heating and air-conditioning systems, dirty duct work and vent covers, condenser pans filled with debris.
31.	CA	Sacramento	BRI	1994	Twin Towers State Offices	Study now completed by CDC. 18.9% of 3,300 reported fatigue at least 1 month/per year. Recommendations will come later.
32.	CA	San Diego	SBS	1990	San Diego County Courthouse	Deaths and mysterious illness; asbestos cleared as cause.
33.	CA	San Diego	SBS	1990	(Henchey v. Income Property Group Office Park Building, et al.)	Ventilation; suit settled for $65,000.
34.	CA	San Diego	SBS	1994	Palomar College Library	Complaints of headaches, respiratory problems

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						and concentration problems. Plans to remove and replace current heating and ventilation system.
35.	CA	San Francisco	Legion	1992	University of California Medical Center	Water contaminated; one death.
36.	CA	San Francisco	BRI	1992	Langley Porter Psychiatric Institute (University of California at San Francisco)	Poorly designed ventilation system drawing fumes from parking lot.
37.	CA	San Francisco	SBS	1988	Bancroft-Whitney Co.	Over 900 employee complaints.
38.	CA	San Francisco	SBS	1993	University-San Francisco Mission Center Building	General malaise, eye, nose and throat irritation. Diisocyanate from an adjacent automobile body and paint shop. Replace main air filtration system. Cost for ventilation improvement - $500,000.
39.	CA	San Pedro	SBS	1992	Banning High School	Fumes from nearby refinery entering school through ventilation system.
40.	CA	Stanford	Legion	1983	Stanford University Medical Center	7 infected; incidents occurred separately following heart surgery.
41.	CA	Sunnyvale	Legion	1990	Lockheed Missile and Space Co.	Two buildings closed.
42.	CA	Westwood	Legion	1977	Wadsworth Veterans Administration Medical Center	201 cases reported between 1977 and 1981; bacteria traced to drinking water supply.
43.	CA		SBS	1983	Miller v. Lakeside Village Condominium Association CA Ct. of App., 2d Dist., Div. 7, No. B051869	Tenant experienced allergies from mold infested apartment; case dismissed based on statute of limitations.
44.	CO		SBS	1992	District Attorneys Office, 16 Jud. Dist. (Avery-Jorganson v. District Attorney)	
45.	CO		SBS, Radon	1990	(Brafford v. Susquehanna Corp.)	Risk of future cancer.
46.	CO	Castle Rock	SBS	1991	Douglas County School District Administrative Offices	19 employee complaints.
47.	CO	Denver	Legion	1992	St. Anthony Hospital Central	3 dead, 2 others infected; traced to hot water tank.
48.	CO	Denver	SBS	1989	Federal Building	Numerous illnesses; health survey conducted.
49.	CO	Ft. Collins	SBS	1992	Colorado State University	115 employee complaints of symptoms; cause is under investigation.
50.	CO	Lamar	Legion	1989	Best Western Cow Palace	18 ill, three dead.

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51.	CO	Rocky Flats	BRI	1991	Rocky Flats Nuclear Weapons Plant (U.S. Department of Energy)	Plutonium in ventilation system; building closed.
52.	CO	Westminster	SBS	1990	City Pool	Ventilation system; lifeguards suffering from hypersensitivity pneumonitis; contractors are being sued; 82 workers' comp claims filed.
53.	CT	Bristol	BRI	1984	Police - Court Complex	Mold in ducts; employees experiencing SBS symptoms; experts suggested cleaning and rebalancing ventilation system and monitoring cleaning materials.
54.	CT	Hartford	SBS	1992	Bulkeley High School	Students exhibit classic sick building syndrome symptoms.
55.	CT	Hartford	SBS	1991	One Myrtle Street (Padgett v. Capital West Associates, et al.) (Potential class action)	Bad ventilation, general uncleanliness, 40 plaintiffs reportedly asking for $1 million each.
56.	CT	Hartford	SBS	1991	U.S. Post Office (Mendenhall, et al. v. Kerin; Clarkin v. Kerin) (potential class action)	Eye and lung problems.
57.	CT	Middletown	legion	1993	Connecticut Valley Hospital	Source of infection still unknown; examination and cleaning of air-conditioning system as a precaution; attempt to determine whether 4 other cases of pneumonia are related to same problem.
58.	CT	New Britain	SBS	1984	New Britain High School	Expert recommended upgrading ventilation system.
59.	CT	New Haven	Legion	1986	Hospital of St. Raphael	Hot water pipes.
60.	CT	New Haven	BRI	1985	Yale Medical School, Dept. of Epidemiology and Public Health	New carpet glue.
61.	CT	Stamford	SBS, Legion	1990	West Main Street Shelter	Inadequate ventilation; moisture in walls; rat and bug infestation; building to be demolished.
62.	CT		SBS	1991	Connecticut insurance company	Class action suit alleging that building conditions adversely affected its employees' health.
63.	DC		SBS	1990	EEOC Headquarters	Fungus in ventilation; building to be gutted.
64.	DC		SBS	1989	U.S. Dept. of Interior (Perkins v. Maitico Operating Co.)	Excessive heat, humidity and bacteria; case settled.
65.	DC		BRI	1988	U.S. Information Agency	Lead in water.
66.	DC		SBS	1986	General Services Administration Building	Mysterious ailment sent 20 to hospital.

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67.	DC		Graves	1991	White House	Lead pipes/paint.
68.	DC		Legion	1991	SSA Payment Center	
69.	DC		SBS	1989	Parklawn Building, U.S. Dept. of HHS	
70.	DC		SBS, Legion	1989	Madison Building, Library of Congress	Tests ordered.
71.	DC		SBS	1988	EPA Waterside Mall (Bahura v. SEW Investors)	New carpet.
72.	DC		SBS	1989	U.S. Housing and Urban Development Building	
73.	DC		SBS	1989	Frances Perkins Building, U.S. Labor Dept.	
74.	DC		BRI	1986	Hubert Humphrey Office Building	25% developed hypersensitivity pneumonitis; leaking cafeteria pipes.
75.	DC		SBS	1992	National Museum of American History, Smithsonian Institution	Asbestos fibers floating in corridors from ventilation system.
76.	DC		SBS	1993	U.S. Information Agency (USIA) Library	Air was rendered unbreatheable; inspection of Colonial parking garage below, revealed fan venting carbon monoxide straight into library.
77.	DC		BRI	1993	EPA offices	New carpeting blamed for making employees sick; carpets have been removed.
78.	DC		SBS	1993	National Oceanic and Atmospheric Administration Building, No. 1	Complaints of headache, flu-like symptoms; inadequate ventilation system, presence of phenol found; 4 employees received workers' compensation for illnesses; considering improving ventilation and removing phenol.
79.	FL		SBS	1990	(Stillman v. South Florida Savings & Loan)	Breach of contract case.
80.	FL		SBS	1991	(Eagle-Picher Industries v. Cox)	Florida District Court.
81.	FL	Bartow	SBS	1991	Imperial Polk County Judicial Complex (Polk County v. Barton-Malow Co. & W. Wade Setliff)	300 have filed workers' comp claims; mold, high humidity, faulty air conditioning system; $18 million lawsuit filed against contractors; employees readying suit against County and others.
82.	FL	Barstow	BRI	1993	Polk County Courthouse	Moisture vapor into dry wall; new roof required; cost to fix building estimated at $22.5 million; ventilation system to be replaced.
83.	FL	Brooksville	SBS	1992	Hernando County Courthouse	Inadequate ventilation, leaky roof, sagging ceilings, moldy walls and carpets; county to begin $2 million renovation; employees want to be moved out.

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84.	FL	Dade City	SBS	1992	Eastside County Courthouse	Need to improve HVAC maintenance.
85.	FL	Deerfield Beach	SBS	1991	House of Insurance	Complaints filed.
86.	FL	Deland	BRI	1993	Deland Courthouse	Judge experiences vertigo; is hospitalized; incapacitated for 4 months; mold growths, wetness problems, poor ventilation; county seeking $250,000 to repair roof and air-conditioning system.
87.	FL	Deland	SBS	1993	Volusia County Courthouse	Workers complain of respiratory tract problems; mold, mildew on walls, ceilings and in air duct system; many areas have poor ventilation, high carbon dioxide levels; plan to replace roof and air conditioning system.
88.	FL	Deland	SBS	1994	Volusia Courthouse Building	Concerns with air circulation and ventilation; 5 circuit court employees intend to sue; whole building to be evaluated.
89.	FL	Ft. Lauderdale	SBS	1988	Goldman v. Broward County	Workers' Comp.
90.	FL	Ft. Lauderdale	SBS	1991	South Florida Savings Bank (Zandman v. Atria, et al.) (Five additional cases filed)	Nine defendants; destroyed immune systems.
91.	FL	Ft. Lauderdale	BRI	1991	Broward County School (Rosenfeld v. School Board of Broward County)	Paint fumes.
92.	FL	Ft. Lauderdale	SBS	1991	Broward County Library	Complaints filed.
93.	FL	Ft. Lauderdale	SBS	1991	Paragon Building	Complaints filed.
94.	FL	Ft. Lauderdale	SBS	1991	Broward County Airport Control Center	Complaints filed.
95.	FL	Fort Meade	SBS	1991	Fort Meade City Hall	Inadequate HVAC system; mold; mildew.
96.	FL	Fort Pierce	SBS	1990	State Attorneys' Office Building	Improper HVAC caused mold/mildew build-up; employees have filed suit against St. Lucie County claiming permanent injuries.
97.	FL	Gainesville	SBS	1986	Veterinary School, Univ. of Florida	Ventilation system; mold and organic chemical pollution.
98.	FL	Gainesville	SBS	1992	Tacachale Community Building	Inadequate HVAC caused mold/mildew on walls and ceiling; building houses 50 mentally impaired patients.
99.	FL	Gainesville	SBS	1992	Santa Fe Community College, Bldg. C	High humidity, mold, mildew.
100.	FL	Gainesville	BRI	1992	Library West, Univ. of Florida	Chemical fumes from asbestos-removal process; faulty ventilation.

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101.	FL	Hernando County	SBS	1992	J.D. Floyd Elementary School	Teachers and students have allergy-type symptoms; school was thoroughly cleaned and carpets replaced.
102.	FL	Inverness	BRI	1993	Citrus Springs Elementary School	Students felt sick at school; respiratory complaints.
103.	FL	Kissimmee	Legion	1992	The Hyatt - Orlando Hotel	Tests are pending; 2 cases confirmed.
104.	FL	Largo	Legion	1994	County Criminal Court Building	2 people tested positive for Legionnaire's disease; bacteria were isolated in an air conditioning unit.
105.	FL	Largo	Legion	1994	Pinellas County Criminal Courts Complex Jail	Bacteria found in a cooling tower on roof of maximum security facility; evacuations may be necessary.
106.	FL	Lauderdale Lakes	SBS	1991	Lauderdale Lakes City Hall	Complaints filed.
107.	FL	Lauderhill	SBS	1991	Lauderhill Mall, State of Florida Offices	Complaints filed.
108.	FL	New Port Richey	SBS	1992	Westside County Courthouse	Need to improve HVAC maintenance.
109.	FL	Oakland Park	SBS	1991	Northridge Medical Plaza, V.A. Clinic (Clavon v. Northridge Medical Plaza)	Dangerous mold in air.
110.	FL	Oldsmar	SBS	1992	Oldsmar Elementary School	Moldy, moist air; school was closed for repairs.
111.	FL	Orlando	BRI	1993	West Orange High Cypress Creek High Walker Middle Liberty Middle Chickasaw Elementary Blankner Elementary	Amount of mold is 35 x higher than test results show; students complaints include headaches, fatigue, sinus infections, coughing; due to inadequate and/or poorly operating air-conditioning.
112.	FL	Orlando	BRI	1993	Palmetto Elementary School	Teacher diagnosed with chronic fungal sinusitis; air in buildings tainted by chemical vapors, molds, and poor ventilation.
113.	FL	Orlando	BRI	1993	Oldsmar Elementary School	Student developed asthma; parents push for testing; school closed.
114.	FL	Orlando	SBS	1993	Hyatt-Regency International Airport Hotel	Mildew present in 159 of its 445 rooms; clean up is planned.
115.	FL	Orlando	SBS	1993	Orange County Government Building	Almost a dozen workers have been affected; solution estimated at millions of dollars; 10 workers were awarded disability - 2 permanent; health officials starting to recognize Florida as nation's "sick building" capital. Ventilation system inadequate.

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116.	FL	Orlando	SBS	1993	Brevard County School	Parents have removed children from school; asbestos was found.
117.	FL	Osceola	Legion	1992	Hyatt-Orlando Hotel	3 men at an American Sheep Industry convention were hospitalized; sources still unknown; hotel conducts regular maintenance of air-conditioning system; scrubbing air conditioners; chlorination of pools and water fountains.
118.	FL	Palm Bay	SBS	1993	Discovery Elementary School	"Flu-like symptoms; clean up of air conditioning system; burning eyes, upper respiratory problems, "onion-type" odor may be due to sulfate.
119.	FL	Palm Harbor	SBS	1992	Curlew Creek Elementary School	Mold and mildew from high humidity levels; IAQ firm recommended new carpet, upgrading HVAC and more frequent cleaning; six teachers have received workers' compensation due to respiratory problems from poor IAQ.
120.	FL	Pensacola	SBS	1990	Escambia County Dept. of Public Health	Mold, mildew and poor ventilation.
121.	FL	Port St. Lucie	SBS	1989	Bayshore Elementary School	Inadequate HVAC; students and teachers symptomatic.
122.	FL	St. Petersburg	SBS	1993	J.D. Floyd Elementary School	Carbon dioxide levels exceeded industry standards; bacteria and humidity at unacceptable levels; air-conditioning thermostats malfunctioned.
123.	FL	St. Petersburg	SBS	1993	River Ridge School	Teachers complain of runny noses, nasal congestion, and odors; 2 buildings in question; ventilation system targeted.
124.	FL	Spring Hill	SBS	1992	Pine Grove Elementary School	School was scrubbed, caulked, carpet replaced and drainage system changed.
125.	FL	Stuart	SBS	1989	Martin County Courthouse Complex	Mold, algae, fungus in air conditioning ducts; 10 treated at hospital; toxic fungi discovered in late 1992; building closed; dozens being tested for health problems; "lawsuits are flying".
126.	FL	Stuart	SBS	1993	Martin County Courthouse	200 people complained of odors, mold on walls, headaches, nausea, rashes; several admitted to hospital; contaminated air conditioning system; leaks in roof; 21 employees filed claims.
127.	FL	Tallahassee	SBS	1992	Doyle Carlton Building	Chemical fumes from building clean-up.
128.	FL	Tampa	SBS	1992	Hillsborough County Crisis Center	Dirty ventilation ducts; closed fresh-air intakes; high carbon monoxide levels.

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129.	FL	Tampa	SBS	1992	University Community Hospital	OSHA investigated following 20 IAQ complaints but found no basis for problems.
130.	FL	Tampa	SBS	1989	Office of Disability Determination	Pigeon skeletons and bird droppings found in ventilation system.
131.	FL	Tampa	SBS	1992	George Edgecomb County Building	Violation of air quality standards; cited by state.
132.	FL	Tampa	Legion (?)	1994	Lockhart Elementary School	Suspected, but not confirmed case; investigations are on-going. Pigeons may be a source of problem.
133.	FL	University Station	SBS	1991	John and Grace Allen Administration Building University of South Florida	Inadequate ventilation; water damaged carpets and ceiling tile; 77 have filed workers' comp claims; NIOSH investigated.
134.	FL	West Palm Beach	SBS	1991	City Hall	Undersized fresh air intakes.
135.	FL	West Palm Beach	SBS	1991	Palm Beach County Governmental Center	Complaints filed.
136.	FL	Ybor City	SBS	1991	Lozano Building Hillsborough County Environmental Protection Commission	High carbon dioxide levels, inadequate ventilation; termite infestation creating a dust problem.
137.	GA		SBS	1990	Administration Building, University of Georgia	NIOSH investigated, found mold, low humidity and inadequate ventilation; building is smoke-free.
138.	GA	Atlanta	SBS	1980	101 Marietta Tower Bldg.	Dust and humidity; NIOSH investigated.
139.	ID		SBS	1988	North Idaho College, Hedland Vocational Building	Fumes entering ventilation system and circulating throughout building from shop classroom.
140.	IL	Chicago	SBS	1991	Wrigley Building	Ventilation system; exhaust from boats docked below building.
141.	IL	Chicago	Legion	1991	Social Security Administration Bldg.	Bacteria found; evaluated after outbreak in Richmond, CA.
142.	IL	Chicago	SBS	1992	Cook County Vital Statistics Bureau	Poor ventilation, paper mites in basement; workers complaining of rashes, respiratory problems.
143.	IL	Chicago	SBS	1993	Chicago's Daley Center	Cancer-causing chemicals found in soot spewing from air vents. Complaints of asthma, bronchitis, dizziness, nausea and fatigue. Problem result of a faulty boiler. Benzopyrene and benzanthracene identified.
144.	IL	Chicago	BRI	1993	Hinsdale Hospital (Elmwood Hall)	Hospital employees complain of burning in sinuses and ears; emergency room care required; faulty ventilation.

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145.	IL	Chicago	SBS	1993	St. Charles Community High School	Complaints of nausea, headaches and flu-like symptoms; ventilation problems.
146.	IL	Chicago	Legion	1993	University of Illinois Hospital	Bacteria in facility's water system; transplant patient dies of Legionnaire's Disease.
147.	IL	Chicago	Legion	1993	University of Illinois at Chicago (Education, Communications and Social Work Building).	Ventilation may be faulty; professor died of pneumonia; more than a dozen employees complained of feeling ill.
148.	IL	Chicago	BRI	1994	Bolingbrook's Addams Middle School	Tests by industrial hygienists indicated hydrogen sulfide emitted from rooftop vents led to over 2 dozen students being hospitalized; ventilation system needs re-routing.
149.	IL	Chicago	SBS	1994	Rolling Meadows Junior High School	5 cancer-related deaths of staff; medical experts hired to determine possible link to Plumgrove school deaths.
150.	IL	DuPage	SBS	1993	Judicial Office Facility	Several workers required emergency hospital care; faulty engineering in ventilation system.
151.	IL	DuPage	BRI	1993	Hinsdale Middle School	Ventilation system sucking stale air back into classroom; students falling ill. Recommended redirecting exhaust air ducts to discharge above roof.
152.	IL	DuPage	SBS	1993	GlenEllyn Elementary School	Formaldehyde and carbon dioxide detected in a portable unit; deficiency in ventilation system.
153.	IL	St. Charles	SBS	1992	St. Charles Community High School	Grievance filed with teachers' union; IAQ tests showed high carbon dioxide levels, inadequate fresh air, high dust levels.
154.	IL	Hanover Park	SBS	1994	Johnson School	Complaints from teachers and pupils; IAQ company to test for carbon dioxide, humidity levels.
155.	IL	Hinsdale	SBS	1992	Hinsdale Middle School	Students experiencing illness; IAQ firm has been hired to evaluate.
156.	IL	Hinsdale	SBS	1992	Lane Elementary School	Carpet emissions were blamed for illnesses; problems allegedly solved by cleaning carpets.
157.	IL	Palatine	SBS	1994	Plumgrove Junior High School	5 staff dead between 1982-1992; several developed breast cancer and some respiratory ailments during 1993-94; asbestos floor tiling and pipe insulation removed in 1993.

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158.	IL	Waukegan	BRI	1993	Lake County Health Department (Belvedere Medical Building)	Nurses report sinus problems and occasional shortness of breath; dust and mold in the ventilation system; cleaning of carpets and regular inspection of ventilation system will occur.
159.	IL	Wheaton	SBS	1992	DuPage County Courthouse (County of DuPage v. NOK et al.) (Bostick v. County of DuPage)	Tests inconclusive; building newly constructed; 20 employees hospitalized; courthouse closed for repair; scheduled to reopen March 1993.
160.	IN	Evansville	Legion	1985	St. Mary's Medical Center	
161.	IN	Indianapolis	Legion	1988	Methodist Hospital	10 cases, 5 deaths; water system.
162.	IN	Kokomo	SBS	1990	Western Primary Elementary School	76% of students exhibited symptoms and transferred to another building; HVAC was replaced in mid-1992.
163.	IN	Lebanon	Legion (?)	1993	Harney Elementary School	Suspected Legionnaire's disease - related pneumonia of 17 students.
164.	IN	Russiaville	SBS	1991	West Elementary School	HVAC; NIOSH investigated.
165.	IN		BRI	1992	Indiana office complex	Change in insecticide used at adjoining warehouse, dirty ventilation system and inadequate air intakes; building was decontaminated.
166.	IA	Iowa City	Legion	1981	University of Iowa Hospitals	"Water bug"; 24 cases.
167.	IA	Ottumwa	SBS, Pest	1990	Wapello County and Iowa Depts. of Human Services Building (Bloomquist v. Wapello County)	Pesticides in carpet, HVAC inadequate, leaking sewer line.
168.	IT	Milan	SBS		Office building	HVAC needed minor adjustments.
169.	KS	Belleville	BRI	1990	Agricultural Stabilization and Conservation Services; Soil Conservation Service (USDA Agencies) (Dreeson v. WW Henry Co.)	Carpet glue; cases dismissed.
170.	KS	Wichita	SBS	1989	Pioneer TeleTechnologies	62 ill; tests inconclusive.
171.	KY	Bowling Green	SBS	1988	Richardsville Elementary School	Inadequate ventilation and hog lot next door; high miscarriage rate.
172.	KY	Frankfort	BRI	1993	Cabinet for Human Resources	Test revealed microbes that can cause strep throat, staph. infections and sinus problems; elevated carbon dioxide; dry air; upgrade ventilation system.

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173.	LA	Baton Rouge	SBS	1992	Valley Park Administrative Center, East Baton Rouge Parish	Dirt, dust, mold and fungi in air ducts; building sits atop a landfill.
174.	LA	Baton Rouge	SBS	1991	Pleasant Hall, Louisiana State Univ.	Ventilation system; black particles falling from vents; mold.
175.	LA	Bogalusa	Legion	1988	Winn-Dixie Grocery Store (Crowe v. Winn-Dixie)	Vegetable mister; 33 contracted disease.
176.	LA	New Orleans	BRI	1993	New Orleans' City Hall	Mold, mildew, carbon monoxide, soggy ceiling panels (shedding asbestos); multiple employee complaints; air conditioning system malfunctions; mechanical system in basement the worst; raw sewage, roaches, drums containing chemicals. Needed a comprehensive building management program.
177.	MA	Andover	SBS	1993	West Elementary School	Lack of ventilation, chemicals in carpet and "humidifier fever."
178.	MA	Boston	SBS	1993	University of Massachusetts, Phyllis Wheatley Building	Students nauseous and dizzy; fumes entered through ventilation system.
179.	MA	Boston	SBS	1993	College of Public and Community Service	Secretary hospitalized after experiencing severe symptoms; inhalation of chemical irritant through an air duct; improper installation of ventilation, heating and air conditioning systems.
180.	MA	Boston	SBS	1993	Boston College (Merkert Chemistry Center and Silvio Conte Forum)	Chemicals vented through structure; buildings evacuated pending further investigations.
181.	MA	Boston	SBS	1994	University of Massachusetts (Wheatley Hall, Healey Library)	27 people sought medical treatment; unexplained nausea, burning lips and tight throats; inspection of sewage and ventilation systems to be done.
182.	MA	Boston	BRI	1994	University of Massachusetts (Wheatley Building and Healey Library)	5 employees, 2 students treated for airborne illness; (to date 50 employees have been affected) sore throats, dizziness, decreased motor skills; studies of ventilation systems, furniture and campus sewer; $550,000 for renovation of ventilation system.
183.	MA	Fall River	Legion	1993	Notre Dame Church	Source could be funeral parlour adjacent to church; 3 cases confirmed.
184.	MA	Fall River	Legion	1994	Stafford Apartment Complex	legionella bacteria found in cooling tower; 11 people infected.
185.	MA	Danvers	SBS	1993	Dunn Middle School	Lethargy, headaches; inadequate ventilation.
186.	MA	Danvers	SBS	1993	Smith Elementary School	Lethargy, headaches; poor ventilation. EPA recommends keeping ventilation systems clean and operating.

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187.	MA	Lynn	SBS	1993	Lynn City Hall	Employees request IAQ inspection.
188.	ME		SBS	1991	Maine Department of Transportation	Building being monitored, test results pending.
189.	MD	Baltimore	Legion	1993	Sarah M. Roach Elementary School	1 teacher, 12 students developed chronic illness; ventilation and heating problems.
190.	MD	Baltimore	SBS	1994	General Hospital, Carroll County	Complaints since 1978; poor IAQ; ventilation system needs to be balanced; spraying with biocide was no help; roof needs repair to reduce mold.
191.	MD	Bethesda	Legion	1984	Bethesda Naval Hospital	Showerheads and faucets
192.	MD	College Park	Legion	1986	University of Maryland	Bacteria in utility tunnel and air conditioning system; bacteria found in 3 buildings.
193.	MD	Hagerstown	Legion	1990	Western Maryland Center State Hospital	Hot water system; 6 ill.
194.	MD	Rockville	Legion	1991	U.S. Public Health Service Building	Test results pending.
195.	MD	Waldorf	SBS	1987	Thomas Stone High School	Blackish mold.
196.	MD	Woodlawn	SBS	1991	U.S. Health Care Financing Administration, Meadows East Building	Fungus contamination; tests did not confirm; earlier incident in 1986.
197.	MD	Woodlawn	SBS	1986	City Office Building	Complaints followed asbestos removal.
198.	MD	Baltimore	SBS	1989	Lighting Limited	New carpet blamed.
199.	MA	Andover	SBS	1991	West Elementary School	Mold in Basement; ventilation.
200.	MA	Boston	Legion	1988	Metropolitan State Hospital	
201.	MA	Boston	SBS	1993	Rowes Wharf Office Highrise	law firm tenant says insulation fibers are coming through buildings ventilation system; building managers say law firm's carpet is emitting VOCs; [building managers have hired Anderson labs to test carpets] [law firm has hired Laurence Kirsch to represent them]; firm moving out, managers vow to sue.
202.	MA	Cambridge	SBS	1982	Cambridge Rindge & Latin High School Arts Building	HVAC; elevated carbon dioxide levels; birds nesting in air ducts; moldy carpet; teacher testified in Congress in 1988; litigation pending against contractors.
203.	MA	Cambridge	SBS	1980	Cambridge High and Latin School	Building was torn down and merged with Cambridge Rindge and Latin School [don't know why demolished].

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204.	MA	Cambridge	SBS	1991	Tobin School	School built over former dump site; inadequate ventilation; elevated methane levels.
205.	MA	Norwood	SBS	1990	Polaroid	Leaking generator exhaust fumes, insufficient fresh air; company contemplating smoking restrictions.
206.	MI	Detroit	SBS	1986	Madison Center (Court Building)	New renovations; 100 hospitalized.
207.	MI	Detroit	Legion	1985	Airport Hilton Inn	Bacteria in air conditioning.
208.	MI	Jackson	Legion	1993	Southern Michigan Prison	31 inmates stricken; 3 died; spread through ventilation system.
209.	MI	Pontiac	Legion, SBS	1991	Oakland County Complex	Investigation underway, test results are pending; also upper respiratory infections reported and problems with ventilation system.
210.	MN	Brainerd	SBS	1993	Brainerd Community College (Room 19)	Teachers complain of nausea, headaches, dizziness, foul odors; ventilation system inadequate; air-distribution problem.
211.	MN	Duluth	SBS	1993	University of Minnesota, Library	12 employees, 1 student; complaints of respiratory illness; dust and mold spores; very poor ventilation that could have bred mold, contractor hired to clean.
212.	MN	Minneapolis	SBS	1993	Minnesota Health Department	Fresh air intake directly above the building's loading dock where garbage trucks run their motors to compact trash.
213.	MN	St. Paul	SBS	1993	Northern Service Center Building	Complaints of eye irritation, nasal congestion neck and back pain, may be cancer-related; 17 out of 47 employees reported diagnosed cancer. Private consultant to analyze IAQ.
214.	MN	St. Paul	SBS	1993	Centennial Building	Fumes from trucks idling at the loading dock drawn into building.
215.	MO	Centralia	BRI	1986	(Pinkerton v. Temple Industries Inc.)	Indoor formaldehyde exposure; $ 16.2 million jury award.
216.	MO	Dixon	BRI	1993	Dixon Elementary School	Unexplained rashes which go away after leaving school reported by teachers and students; tests still underway; high dust levels, low humidity, inadequate ventilation, dead birds above ceiling; problems disappeared following thorough cleaning and airing out.
217.	MO	Jefferson City	SBS	1986	Truman State Office Building	Several dozen employees sick.

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218.	MT	E. Helena	SBS	1981	Tri-Valley Credit Union Building	Tests inconclusive.
219.	NE	Lincoln	Legion	1986	Federal Building	
220.	NV	Carson City	SBS	1987	State Capitol Building	Tests inconclusive; legislators have allergies; could not find cause.
221.	NV	Lake Tahoe	BRI	1991	Harvey's Wagon Wheel (Scott v. Harvey's Wagon Wheel, Inc.)	Pesticides; 15 have lingering illness.
222.	NH	Concord	SBS	1991	Beaverbrook Elementary School	Poor indoor air quality; new HVAC system installed.
223.	NH	Nashua	SBS	1987	New Searles Elementary School	Damp air, molds, ventilation.
224.	NJ	Atlantic City	BRI	1991	Bally's Park Place Hotel and Casino (Secretary of Labor v. Bally's)	Iodine emissions from cold-water glass washing machine.
225.	NJ	Camden	SBS	1990	Camden County Administration Building (Lipsitz v. Scallop Thermal Management)	
226.	NJ	Flemington	Legion	1989	Hunterdon Central Regional High School	
227.	NJ	Jersey City	SBS	1992	590 Newark Ave. Bldg (owner is Congressman Frank Guarini who rents building to the state)	Faulty HVAC system; water leaks; fumes from repair work.
228.	NJ	Mahwah	SBS	1991	Municipal Offices	High carbon dioxide levels; inadequate ventilation.
229.	NJ	Mahwah	SBS	1991	Ramapo College	Ventilation system; contaminated laboratory air.
230.	NJ	Red Bank	SBS	1987	Bell Communications Research Building	Hydraulic elevator system, poor general ventilation, high levels of VOCs found; tobacco smoke may contribute.
231.	NM	Albuquerque	Legion	1991	Social Security Administration	Bacteria found; evaluated after outbreak in Richmond, CA.
232.	NY	Albany	SBS, Legion	1989	West Mall Office Plaza NYS Dept. of Estate & Gift Tax (Workers' compensation claim)	Decided March 13, 1991; employee claim; other employees ill; mold in ventilation system.
233.	NY	Albany	SBS	1990	Building 8, State Office Campus Department of Taxation and Finance	Heating units were leaking fluid; other test results pending; building was scrubbed; building sick again in late 1991, union wants building closed.

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234.	NY	Albany	SBS	1990	State Legislative Office Building (LOB)	LOB has been dubbed the "L.O.B.-gionnaire's disease"; workers complain about poor IAQ and say they are symptomatic; Health Department inspected but office of General Services did not adopt any recommendations for improvement; legislators plan to introduce IAQ legislation in response.
235.	NY	Albany	SBS	1993	Building 8, W.A. Harriman State Office Campus	Heating, air conditioning and ventilation systems under repair; invasion of insects; poorly ventilated; inadequately cleaned.
236.	NY	Brooklyn	Legion	1984	Downstate Medical Center	Air conditioning tower.
237.	NY	Buffalo	BRI	1992	Roswell Park Cancer Institute	Rooftop exhaust from labs discharged chemical compounds that were heavier than the air and infiltrated ventilation system.
238.	NY	Buffalo	BRI	1983	Roswell Park Cancer Institute	10 patients, all of whom died, contracted infection from aspergillus bacteria; 4 families won judgments after the deaths were linked to a faulty ventilation system; the hospital had another outbreak of aspergillus infection in October 1992 which is claimed to not be linked to the HVAC system.
239.	NY	Buffalo	BRI	1993	West Seneca Educational Center Print Shop	Complaints of rashes, nosebleeds, headaches; DEC recommended lower vent hood, increase chimney height, to improve ventilation.
240.	NY	Cheektowaga	Legion	1990	St. Joseph Hospital	Five contracted disease; 3 dead; bacteria found in hot water system.
241.	NY	Delmar	SBS	1993	Department of Taxation and Finance	407 people diagnosed with arthritis or asthma; 43 former state employees have sued; class-action suit.
242.	NY	Great Neck	SBS	1992	11 Grace Avenue Office Building	High concentrations of dirt particles; low humidity.
243.	NY	Hauppauge	SBS	1991	State Office Building	Lack of fresh air; clogged ventilation ducts.
244.	NY	Helmuth	Legion	1993	Collins Correctional Facility	2 inmates have contracted Legionnaire's disease.
245.	NY	Hudson County	BRI	1989	Whitney Young Elementary School	Chromium residue.
246.	NY	Long Island City	SBS	1992	Community Alternatives System Agency	Dirty ventilation system; several workers have filed union grievances.
247.	NY	Nassau	SBS	1992	Nassau Community College	Teacher testified at state legislative hearing on IAQ.

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248.	NY	NYC	SBS	1988	100 Gold Street Building NYC Department of Housing Preservation and Development	Inadequate ventilation; renovation.
249.	NY	NYC	Legion	1987	General Services Administration	Water tower was decontaminated.
250.	NY	NYC	Legion	1985	New York Times Company	Six legionnaires; 29 respiratory illness.
251.	NY	NYC	SBS	1991	Brandeis High School	Inadequate ventilation; no air conditioning or humidifying system and no windows.
252.	NY	NYC	SBS	1992	Jewelry Store	Mold in ventilation system.
253.	NY	NYC	SBS	1992	Columbia University, Career Services Center	Carbon monoxide from trucks idling near fresh air intakes; hot and cold spots from poorly operating temp control system; levels of black particles from dirty ventilation system; bug infestation.
254.	NY	NYC	SBS	1993	Fiorello LaGuardia High School for the Performing Arts	Teachers and students are symptomatic; United Federation of Teachers has asked the Board to study.
255.	NY	NYC	SBS	1993	Norman Thomas High School	Teachers and students are symptomatic; United Federation of Teachers has asked the Board to study.
256.	NY	Queens	SBS	1992	Emergency Services Building	Fiberglass particles in air; insects; rodent droppings; general uncleanliness.
257.	NY	Rochester	SBS	1984	Eastman Kodak	Fungus in ventilation system; 115 sick.
258.	NY	Rochester	Legion	1990	Rochester General Hospital	Hot water system.
259.	NY	Ronkonkoma	SBS, Legion	1992	County Building (lawsuit)	Inadequate ventilation.
260.	NY	Smithtown	SBS	1992	Smithtown Public Library	Inadequate ventilation.
261.	NY	Wappingers Falls	SBS	1983	Wappingers Falls High School	Inadequate ventilation.
262.	NY	Wappingers Falls	SBS	1983	Van Wyck Junior High School	Inadequate ventilation.
263.	NY	Westbury	SBS	1992	New York Terminal Radar Approach Control	High heat, generated by electronic equipment; poor ventilation; general uncleanliness; center is busiest air traffic control in the U.S.
264.	ND	Fargo	SBS	1983	Southeast Human Service Center (Eiseman v. Southeast Human Service Center, 6/9/92)	SBS/MCS lawsuit; employee reinstated with back pay; IAQ testing by state showed IAQ within OSHA standards.
265.	OH	Cincinnati	SBS	1991	Alms & Doepke Building (Beck v. A&D Limited Partnership)	Defective Sewers, dirty ventilation, inadequate fresh air; NIOSH did site survey.

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266.	OH	Cincinnati	SBS	1991	Goodall Building (Martinez v. Goodall Properties, Ltd.)	HVAC systems.
267.	OH	Cincinnati	SBS	1981	(Beebe v. Burlington Industries, Inc.)	New carpet.
268.	OH	Columbus	SBS	1990	Northland Terrace Nursing and Rehabilitation Center	Inadequate ventilation in laundry facility; perfumed diapers; NIOSH investigated.
269.	OH	Dayton	SBS	1990	Wright Patterson Air Force Base	Lack of fresh air and carbon dioxide build-up.
270.	OH	Dayton	Legion	1992	VA Medical Center	Bacteria located in water supply; 2 dead, 1 being treated.
271.	OH	Toledo	BRI	1993	Family Court Center	14 people treated by emergency medical personnel; burning eyes, breathing problems; 100 people evacuated; OSHA inspected; need to raise main air intake which was bringing exhaust fumes/other contaminants into building.
272.	OK	Muskogee	SBS	1990	CH Haskell Building, Oklahoma State University	Cooling tower; University to replace it.
273.	OR	Portland	SBS	1992	Multnomah County Emergency Communications Center	Office is in former bomb shelter atop Kelly Butte; tests inconclusive; inadequate ventilation suspected; employees ill.
274.	OR	Salem	SBS	1984	State Commerce Building	Tests inconclusive; suspected are transient fumes, cigarette smoke and "psychogenic factor"; over 60% of employees exhibited symptoms.
275.	PA	Colwyn	BRI	1993	Colwyn Elementary School	Fungus-infested classrooms; students moved to new location.
276.	PA	Greensburg	SBS	1992	Westmoreland Manor County Home for the Elderly	Tests pending; employees ill.
277.	PA	Harrisburg	BRI	1991	Sporting Hill Elementary School	Solvent used during asbestos removal.
278.	PA	Kulpsville	Legion	1992	Penn Fishing Tackle Mfg. Co.	Manufacturing process blamed; 3 have contracted disease.
279.	PA	Philadelphia	Legion	1991	Social Security Administration	Bacteria found; tested after outbreak in Richmond, CA.
280.	PA	Philadelphia	SBS	1993	M. Thomas Stone Library Bryn Mawr College	Three say they have MCS following renovation; lawsuits have been filed against contractors.
281.	PA	Pittsburgh	Legion	1992	Presbyterian Univ. Hospital	4 deaths; seven confirmed cases; bacteria traced to water supply.

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282.	PA	Pittsburgh	Legion	1993	Gateway View Plaza	7 people contracted disease; 1 died ventilation system needed adjustment.
283.	PA	West Chester	SBS	1992	West Chester University	Employees surveyed; 20% are symptomatic; poor ventilation blamed.
284.	PR	Hato Rey	SBS	1990	HUD Office	Stagnant water in air-handling units; 20% smokers; ban considered.
285.	RI	Providence	Legion	1983	Rhode Island Hospital	Bacteria in exposed water in cooling tower came in through open windows.
286.	RI	Providence	SBS	1992	Green State Airport Terminal	Dirty air ducts; inadequate ventilation; airplane exhaust reaching air intake vents.
287.	SP	Barcelona	SBS	1991	Hotel (built in anticipation of '92 Summer olympics).	Hotel will have SBS problems because air intakes were designed improperly.
288.	TN	Nashville	SBS	1991	Tennessee State Museum	Leaky walls; carpets sprouted mushrooms.
289.	TN	Nashville	SBS	1991	(Metro) Courthouse	Filters and heating and cooling vents; judge suffering from allergies.
290.	TN	Nashville	SBS	1991	Nashville Federal Building	Unidentified fumes; offices were evacuated.
291.	TN	Nashville	SBS	1990	Arista Records Nashville Headquarters	14 employees with symptoms; company moved out of building.
292.	TX	Austin	SBS	1991	Texas Dept. of Housing and Community Affairs	Partition furniture, carpet, lack of fresh air, sewer gases; Texas trying to rectify to insulate from liability.
293.	TX	Austin	SBS	1990	Austin Hospital (Hughes v. City of Austin)	Ventilation problems; airborne chemicals; unidentified dust; plaintiff was smoker; defense verdict.
294.	TX	Austin	SBS		Texas Board of Pardons and Paroles	Mold, contaminated carpets, leaking sewer gases, ozone pollution from copiers.
295.	TX	Baytown	SBS	1992	Lamar Elementary School	Infestation of mold and mildew in air conditioning systems; affected area dubbed "death wing".
296.	TX	Baytown	SBS	1992	Ashbel Smith Elementary School	Tests found fungus; six classrooms were relocated; building to be closed.
297.	TX	Baytown	SBS	1992	Bowie Elementary School	Tests are pending.
298.	TX	Dallas	BRI	1992	Ferrell Center, Baylor Univ.	Arena evacuated; carbon monoxide fumes from gusty wind and open boiler room door.

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299.	TX	Dallas	SBS	1986	(Moore v. Polish Power, Inc.) 720 S.W.2d Tx App.	VOCs -- formaldehyde; trial court directed verdict for defendant; case remanded on appeal.
300.	TX	Dallas	SBS, Legion	1993	J.L. Long Middle School	48 out of 70 teachers reported respiratory problems; 1934 hearing and air conditioning systems are suspect; water fountains or air ventilation may be source.
301.	TX	Houston	Legion	1982	Johnson Space Center - NASA	Possible outbreak; autopsy results pending.
302.	TX	Houston	BRI	1991	Judwin Properties Apartment Complexes (Flores v. Winograd)	Exposure to misapplied chlordane; $10.5 million jury award.
303.	TX	Houston	Legion	1992	Fire Station No. 1	Leaky roof, suspected dirty ventilation system tests pending.
304.	TX	Wimberly	SBS	1988	Amelia Scudder Elementary School (Rogers v. Benjamin Moore & Co.)	Hydrocarbons, carbon dioxide and formaldehyde exposure from building materials; 40 plaintiffs, 25 defendants; trial set for spring 1993.
305.	UT		Legion	1990	VA Hospital	
306.	UT	Moab	SBS	1987	State Social Services Office Building	Heating and cooling system, mold in carpet; NIOSH investigated and found no problems.
307.	UT	Ogden	Legion	1991	IRS Service Center	Tests negative, water system purged.
308.	VT	Burlington	Legion	1980	University of Vermont College of Medicine	Campus cooling tower; 17 dead, 62 ill.
309.	VT	Montpelier	SBS	1992	Medical office	New carpet emissions; employees suffer from MCS; carpet was removed.
310.	VA	Arlington	SBS	1988	USA Today Headquarters	Recent office renovation; NIOSH investigated tests inconclusive; 14 miscarriages.
311.	VA	Arlington	SBS	1993	Kenmore Middle School	Illness due to poor ventilation; exposure to dust, chemicals, asbestos; 7 school teachers suffered miscarriages; NAS concluded: "Far too little is known about how such chemicals affect the young, and there is 'potential for concern.'"
312.	VA	Arlington	SBS	1993	Wilson High School	Sickness from formaldehyde.
313.	VA	Blacksburg	SBS	1988	Cowgill Hall-Virginia Tech	Indoor air pollution; building was thoroughly cleaned; HVAC was upgraded.
314.	VA	Chesterfield County	SBS	1992	Crestwood Elementary School	Tests inconclusive; 22 students ill.
315.	VA	Clinton	SBS	1993	Francis T. Evans Elementary School	Broken air-flow valves; ventilation problem; students and teachers sick.

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316.	VA	Clinton	SBS	1993	Prince George's School	Headaches, fatigue, coughing and stuffy nose; ventilation problem.
317.	VA	Gaithersburg	SBS	1993	Diamond Elementary School	High absenteeism from respiratory illness; malfunctioning ventilation system.
318.	VA	McLean	SBS	1986	Franklin Sherman Elementary School	Poor ventilation; 2 rooms were sealed off.
319.	VA	Richmond	SBS	1989	Montrose Elementary School	Mold-infested ventilation system; school newly renovated; school was closed following complaints; school board readying lawsuit.
320.	VA	Richmond	BRI	1990	Office	Loose fiberglass in ventilation system.
321.	VA	Springfield	SBS	1990	West Springfield High School	Tests inconclusive, renovations recently completed; cluster fainting; no cause ever found.
322.	VA	Suffolk	SBS, Legion	1991	Human Resources Building	Inadequate ventilation and indoor contaminants.
323.	VA	Virginia Beach	SBS	1989	Salem High School	Inadequate HVAC system; high carbon dioxide levels; mold/mildew.
324.	VA	Virginia Beach	SBS	1990	Birdneck Elementary School	Inadequate HVAC system.
325.	VA	Virginia Beach	SBS	1990	Brandon Junior High School	Tests inconclusive; problem appeared after walls were painted.
326.	WA	Asotin	SBS	1993	Asotin Elementary School	Students and teachers suffered headaches and nausea; glue may be source; were relocated until problem resolved; ventilation system needed adjustment.
327.	WA	Coeur d'Alene	SBS	1988	Fire Station No. 2	Station located next to a landfill; fumes entering ventilation system; employees were evacuated to another work site.
328.	WA	Everett	SBS	1994	North Middle School	School closed because students vomited, suffered headaches and nausea; changed ventilation systems and filtering systems.
329.	WA	Kettle Falls	SBS	1990	Kettle Falls High School	Black mold; 25% absenteeism.
330.	WA	Monroe	Legion	1987	Monroe Reformatory, Washington Dept. of Corrections	Bacteria in water supply.
331.	WA	Pomeroy	SBS	1993	Pomeroy High School	4 staff suffering symptoms; ventilation, heating and cooling systems adjusted.
332.	WA	Seattle	SBS	1980	State Department of General Administration	Poor air circulation; build-up of toxic fumes from building materials.

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333.	WA	Seattle	SBS	1991	Harbourview Medical Center	Low ceilings and inadequate ventilation.
334.	WA	Seattle	SBS	1991	John Hay Elementary School	Inadequate ventilation; 24 ill.
335.	WA	Seattle	SBS	1991	Snohomish County Courthouse	Poor ventilation, copy machines, damp carpeting.
336.	WA	Seattle	SBS	1993	Port of Seattle Building	Employees complain of watery eyes, headaches, nausea and vomiting; improve ventilation; hired an environmental and engineering consultant.
337.	WA	Spokane	Legion	1985	City Public Safety Building	Bacteria in air conditioning unit.
338.	WA	Spokane	SBS	1992	Garry Middle School	Students experienced respiratory problems; source was never identified.
339.	WA	Tacoma	SBS	1990	Highrise office building	
340.	WA	Tacoma	SBS	1992	King County Courthouse	IAQ tests pending.
341.	WA		SBS		(Tarrant v. Zittings Reality) Wa. App. Case No. 10059-6-111	VOC - formaldehyde; ruled realtor has no duty to disclose.
342.	WV	Welch	SBS	1989	Mount View High School	Tests revealed "tight building syndrome present".
343.	WI	Eau Claire	Legion	1979	Holiday Inn	Hotel found guilty of negligence in deaths of 3 guests; bacteria entered air conditioning system through open fireplace damper.
344.	WI	Madison	SBS	1992	State Public Defender's Office Schmitt v. Bartow Associates	Worker's compensation award of $2,300; inadequate ventilation.
345.	WI	Green Bay	Legion	1991	Brown County Mental Health Center	
346.	WI	Milwaukee	BRI	1990	West Milwaukee School District (Byrne v. West Allis/W. Milwaukee School District)	Airborne fungi; defense verdict.
347.	WI	Milwaukee	SBS	1991	809 Building	HVAC system.
348.	WI	Monona	SBS	1993	Nichols Elementary School	Student ill allegedly from carpet emissions; notice of claim filed with state attorney general seeking $1.2 million in damages.
349.	WI	Port Washington	SBS	1989	Ozaukee County Courthouse	Ventilation systems, bacteria in air conditioning system, VOCs in carpets, exhaust fumes, ozone.
350.	WI	Sheboygan	Legion	1986	Plastics plant	Cooling towers.

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351.	WI	Traux	SBS	1991	Madison Area Technical College	"Litany" of IAQ problems; innovative rooftop chute system installed.

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OSHA SEPARATES ETS FROM ITS PROPOSED RULE ON IAQ BY CLAIMING THAT VENTILATION PROCEDURES CANNOT ADDRESS ETS. OSHA'S POSITION IS GROUNDLESS, CONTRARY TO BOTH THEORY AND PRACTICE AND DICTATED BY A POLICY DEDICATED TO THE ELIMINATION OF SMOKING

OSHA's Proposed Rule on IAQ addresses common indoor air contaminants such as microbiologicals, dusts, chemicals and by-products of human metabolism through provisions designed to ensure the proper operation and maintenance of ventilation systems. Increased ventilation, proper air distribution and maintenance of a building's heating, ventilation and air-conditioning (HVAC) system effectively serve to dilute and remove such common substances from the indoor air. 59 Fed Reg. 16003.

With remarkable disregard to the OSHA RFI docket, the published scientific literature and accepted theoretical and practical knowledge about HVAC design and operation, OSHA states that the ventilation approach in its Proposed Rule on IAQ cannot be applied to complaints about, or exposures to, ETS in the workplace. 59 Fed Reg. 15970, 16003.

OSHA states that "the primary objective of the tobacco smoke provision is to eliminate the nonsmoker's exposure to ETS." 59 Fed Reg. 16016 (emphasis added). OSHA's Proposed Rule on indoor air quality in work environments, while presenting the outward appearance of a single, comprehensive approach to indoor air

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quality problems through ventilation, actually constitutes two separate rulemakings -- one for environmental tobacco smoke, and one for every other potential constituent in the indoor air. OSHA proposes two separate standards, one designed to reduce exposures to (and potential risks from) every potential substance occurring in indoor air (except ETS), and another designed to eliminate all exposure to ETS in the workplace. According to the Proposed Rule on ETS, the elimination of smoking from the workplace means that it is to be either prohibited entirely or restricted to a separate room that is negatively pressurized and exhausted immediately to the outdoors. 59 Fed Reg. 16023.

OSHA's position on ETS is neither supported nor supportable. OSHA states, but does not demonstrate, that ventilation parameters fail to effectively reduce and minimize exposures to ETS. 59 Fed Reg. 15970, 16003. OSHA attempts to justify its position on the nonapplicability of ventilation to ETS with four unsubstantiated remarks in the Proposed Rule, namely;

(1) "Ventilation systems are designed only to remove occupant-generated contaminants, such as carbon dioxide and odors. These types of systems were not designed to dilute multiple point sources of contaminants that are typically found in non-industrial workplaces." 59 Fed Reg. 15973. The statement is not referenced

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and is in direct contradiction with OSHA's own Proposed Rule for a ventilation-based approach to IAQ problems;

(2) The Proposed Rule also states: "Natural and mechanical ventilation systems are designed primarily to limit the accumulation of products of human respiratory metabolism, and secondarily to limit odor; not to control the byproducts of biomass combustion. Thus, smoking indoors creates air pollution which is not adequately abated by customary ventilation systems." 59 Fed Reg. 15986. This statement also is not referenced and is not supported by the scientific literature. (See analysis below);

(3) The Proposed Rule further states: "Dilution ventilation offers no protection in those cases where, due to the close proximity to a smoker (e.g., contaminant point source), the nonsmoking employee may be exposed to large amounts of sidestream and exhaled mainstream smoke (ETS). Due to the limitations of general ventilation, the smoke cannot be removed from the air before reaching the breathing zone of nearby employees." 59 Fed Reg. 15991. The passage describes a situation in which a given ventilation system may "short-circuit", i.e., a case in which supply air is removed from the space before it can effectively dilute indoor air constituents. OSHA does not explain why such an occurrence would apply only to ETS and not to other constituents found in the indoor air. Moreover, OSHA does not represent in any

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way that such situations are common, nor does it provide quantitation of the extent to which individuals are so exposed;

(4) The Proposed Rule contends: "The carcinogenicity of ETS discounts the use of general ventilation as an engineering control for this contaminant." 59 Fed Reg. 15991-2. The claim that ETS is a carcinogen and therefore cannot be addressed by general ventilation contradicts OSHA's own position on permissible exposure limits (PELs) for numerous so-called "carcinogens" in the workplace.

1. OSHA's Proposed Rule Rejects Application Of The Ventilation Rates Of An Authoritative, National Consensus Standard On Ventilation That Was Designed To Address ETS And Other IAQ Constituents; The Standard, ASHRAE 62-1989, Has Been Incorporated Into The Nation's Major Building Codes (And Is Therefore Incorporated By Reference Into OSHA's Own Proposed Rule On IAQ); The Standard's Effectiveness Is Supported In The Published Scientific Literature And By IAQ Field Applications

The Proposed Rule recognizes ASHRAE Standard 62-1989 ("Ventilation for Acceptable Indoor Air Quality") as a "major ventilation guidance document available to HVAC practitioners," but rejects explicit application of the Standard's ventilation rates to ETS in workplace venues. The Proposed Rule states: "[I]t can only be inferred that the standard [ASHRAE 62-1989] was mostly based on satisfaction of sensory comfort rather than based on the control of

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contaminants like ETS which may contribute to adverse health effects like lung cancer and heart disease." 59 Fed Reg. 15992. However, the express purpose of ASHRAE Standard 62-1989 is to establish ventilation rates and procedures for various indoor settings in order to "control carbon dioxide and other contaminants with an adequate margin of safety and to account for variations among people, varied activity levels, and a moderate amount of smoking."[18] (PM, 3-1074). The ASHRAE consensus Standard has been adopted by numerous states and by the major building code organizations in the United States. (PM, 3-1074). It is the current design standard for ventilation systems in new, remodeled and renovated buildings in the U.S.

The precursor ventilation standard to ASHRAE Standard 62-1989, ASHRAE 62-1981, recommended two levels of ventilation, one for areas in which smoking was permitted, and another substantially lower rate for areas where smoking was prohibited. The prescribed ventilation rate in ASHRAE 62-1981 for offices in which smoking was permitted (20 cubic feet outside air per minute per person (cfm/person)) was 4 times greater than the rate recommended for nonsmoking areas (5 cfm/person).

IAQ problems were reported by those who followed the minimum (nonsmoking) ventilation rates specified in ASHRAE 62-1981. Research indicates that the ventilation rate for nonsmoking areas

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(5 cfm/person) is insufficient to efficiently dilute carbon dioxide and body odor, and that occupants under such conditions may complain of "stuffy" air. Other research indicates that a ventilation rate of at least 15 cfm/person, the minimum rate recommended by ASHRAE Standard 62-1989 and three times the rate recommended for nonsmoking areas by ASHRAE 62-1981, would be necessary and sufficient to disperse normally occurring ambient substances (e.g. CO_2, body odors, etc.), as well as tobacco smoke.[19-21] (ASHRAE, 3-440)

In recent testimony before a Congressional Subcommittee, Mr. John Janssen, the Chairman of the ASHRAE Project Committee for Ventilation Standard 62-1989, stated:

> Prior to the oil embargo of 1973, buildings tended to be over-ventilated and indoor air quality problems were not widely recognized. Ventilation recommendations for office spaces, for example, ranged all the way from 5 to 25 cubic feet per minute per occupant. In 1973, ASHRAE published the first edition of Standard 62, which allowed a minimum of 5 cfm of outdoor air per person for some applications. Most state and city building codes still reference ASHRAE Standard 62-1973, "Standard for Natural and Mechanical Ventilation."
>
> In 1981, the ASHRAE Ventilation Standard was revised to incorporate new technology and new awareness of such issues as tobacco smoke, which was not mentioned in the 1973 version. Research results (some ASHRAE sponsored) showed that the minimum ventilating rate of 5 cfm per occupant permitted under 62-73 would not adequately control occupant-emitted odors. At least 15 cfm per occupant was needed to

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> reduce the odor level to a point acceptable to 80 percent of the people entering an occupied space. This amount of ventilation was found sufficient to control tobacco-smoke odor when the smoking rate is about today's average.[22] (PM, 3-1074)

In ASHRAE's submission to the RFI docket, Janssen writes:

> ANSI/ASHRAE Standard 62-1989 is an authoritative guide for achieving acceptable indoor air quality. The Standard defines ventilation rates needed to achieve freedom from odor, irritation and create a comfortable indoor environment. As the only nationwide consensus-based technical standard on ventilation and acceptable indoor air quality, ASHRAE recommends Standard 62-1989 as the standard of choice for adoption by reference for state and local building codes and regulations. (3-440)

A number of respondents to the RFI endorsed the ventilation procedure specified in ASHRAE Standard 62-1989 and recommended its adoption as the basis to OSHA's Proposed Rule on IAQ. (Law Associates 3-1200; ENV Services, Inc., 3-1089; Organization Resources Counselors, Inc., 3-1084; the National Environmental Development Association's Total Indoor Environmental Quality Coalition (NEDA/TIEQ), 3-1054; Healthy Buildings International (HBI), 3-1053; Systems Applications International (SAI), 3-1052; U.S. Navy, 3-982; Stellmack Air Conditioning and Refrigeration, 3-978; Oklahoma Dept. of Labor, 3-945; Pennsylvania AFL-CIO, 3-908B; Duke Power Company, 3-860; American Association of

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Occupational Health Nurses (AAOHN), 3-803; American Federation of Government Employees, 3-529; ASHRAE, 3-440.)

Other respondents, including governmental and private IAQ investigators and mitigation experts, industrial hygienists and engineers, recommended use of the Standard for achieving acceptable indoor air quality. (Meckler Engineers Group, 3-1081; Theodor D. Sterling & Associates (TDSA), 3-1073; Occupational Illness Support Group Local 12, 3-1017; R.J. Reynolds Tobacco Company (RJR), 3-1087; U.S. Navy, 3-982; Business Council on Indoor Air (BCIA), 3-933; Gershon Meckler Associates, 3-879; the Center for Environmental Assessment, Inc., 3-687; Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA), 3-856; International Brotherhood of Teamsters, 3-858; Consolidated Edison Company of New York, 3-828; Caterpillar, Inc., 3-805; Philip Morris Companies, 3-1074; United Technologies, 3-651; Dow Chemical Company, 3-502; Thomas E. Glavinich, D.E., P.E., 3-498; Ford Motor Company, 3-447; Systems Applications International (SAI), 3-1052.)

One of the largest private IAQ diagnostic and mitigation firms in the U.S., Healthy Buildings International, Inc., writes that "ASHRAE Standard 62-1989, 'Ventilation for Acceptable Air Quality,' is perhaps the single most useful document we have in our efforts to communicate the proper practices for ensuring good indoor air quality in commercial buildings. We support its use,

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continued development and incorporation into future building codes, standards and IAQ legislation." (3-1053)

The submission by Meckler Engineers Group states:

> ASHRAE Standard 62-1989 is the only recognized authority that specifies the desired performance of building ventilation systems. . . . If OSHA decides that it is appropriate to regulate workplace IAQ at the national level, adoption of ASHRAE Standard 62-1989 would be the best strategy. (3-1081)

The EPA's submission to OSHA includes its handbook for remediation of indoor air quality problems. EPA's recommendations include: "Compare design air quantities to building codes for the current occupancy or ventilation guidelines (e.g., ASHRAE 62-1989), and compare ventilation rates to ASHRAE 62-1989." The handbook also recommends that it would be "informative to see how your ventilation rate compares to ASHRAE 62-1989, because that guideline was developed with the goal of preventing IAQ problems." (EPA, 3-1075 D)

2. The Ventilation Rates and Design Specifications of ASHRAE 62-1989 Are Effective in the Mitigation of Indoor Air Quality Problems

In a 1991 publication, Thompson et al., described various retrofit projects for HVAC systems in 26 schools across the U.S. The retrofits followed the design specifications set forth in

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ASHRAE Standard 62-1989 for ventilation.[23] The retrofits were, according to the authors, "very effective" at reducing radon and CO_2 levels in the schools. The authors also reported that "many of the occupants" believed that IAQ had improved. (PM, 1074)

The State of Wisconsin Safety and Building Division reports that, in their experience:

> Almost without fail, . . . complaints are resolved by ventilating the offices or classrooms per state code. This is a provision of outside air (up to 20 cubic feet per minute) per person. . . . These ventilation requirements are supported by the American Society of Heating, Air-Conditioning, and Refrigerating Engineers (ASHRAE). (3-10)

Downing and Bayer recently reported results from more than 35 building IAQ investigations.[24] They reported that the most "common source of IAQ problems has been the lack of proper operation and maintenance (O&M) of buildings." They further observed that "in more than 80 percent of the investigations to date, changes in building O&M significantly improve the perception of IAQ by the occupants." The researchers recommend, as part of their O&M procedure check list for indoor air quality, "to raise outdoor air ventilation to ASHRAE recommended minimums." (PM, 3-1074)

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In 1991, investigators of the U.S. EPA's headquarters in Washington, D.C., reported that they were "unable to establish consistent relationships between major environmental parameters and self-reported health symptoms among the sampled employees."[25] However, based on the number and frequency of complaints among workers in those buildings, the research group recommended that "an attempt to maintain indoor environment in accordance with the ASHRAE guidelines should be made." (PM, 3-1074)

3. The Ventilation Rates In ASHRAE Standard (62-1989) Specifically Address ETS And Have Been Proven Effective In The Dilution And Removal Of ETS Constituents And The Minimization Of Exposure To Nonsmokers

The effectiveness of ASHRAE Standard 62-1989 for the dilution of ETS constituents has been evaluated in a number of scientific studies that were submitted to the OSHA RFI docket.

In 1990, researchers presented results of their work comparing the effects of increased ventilation recommended by ASHRAE 62-1989 in areas where smoking is permitted and in areas where it is prohibited. Through the aid of computer models, the researchers demonstrated that air quality in the areas where smoking is permitted does not differ significantly from air quality in nonsmoking areas, where both areas are supplied with outdoor air at levels recommended by ASHRAE 62-1989.[26] (Holcomb, 3-1065)

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In their review of ETS-related air quality monitoring in different workplaces under various smoking conditions, researchers from TDSA Ltd. conclude "in office areas in which (a) smoking is allowed, and (b) outside air ventilation rates meet or exceed the ASHRAE ventilation standard, nicotine concentrations have typically been less than 5 ug/m^3 and respirable suspended particle levels have ranged between 20 ug/m^3 and 60 ug/m^3. (TDSA, 3-1073)

In their submission to the OSHA docket, scientists from HBI, Inc. summarized the results of a paper entitled "The Measurement of Environmental Tobacco Smoke in 585 Office Environments." (HBI, 3-1053) The authors write:

> Computer analysis shows that when 'blindfolded' for presence or absence of smokers, in most cases realistic smoking levels do not significantly influence the aspects of air quality that were measured, and spill over from smoking areas into nonsmoking areas appears to minimal. This work further reinforces the position the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has taken on ETS in office buildings in ASHRAE Standard 62-1989 (1989), that acceptable air quality can be maintained in properly ventilated offices with a moderate amount of smoking, even without smoker segregation.

Professor Alan Hedge offers the following observation on the basis of his extensive experience in monitoring ETS constituents during investigations of sick-building syndrome: "Our data show that modern ventilation systems are capable of diluting

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the small pollutant loads from smoking at the levels which we observe, without necessarily exposing nonsmokers to significant elevated levels of indoor air pollutants." (3-955)

Company scientists from R.J. Reynolds reported on a recently completed study of four office buildings. (RJR, 3-1087) Two of the buildings investigated had a policy of unrestricted smoking; in the other two buildings, smoking was restricted to separately exhausted lounges. Regardless of smoking policy, RJR reports all ventilation and indoor air quality indicators were "well within applicable standards." The authors write:

> In summary this study demonstrates conclusively (a) that with an HVAC system that is adequately designed, operated in accordance with current ASHRAE standards and properly maintained, all indicators for ETS are at extremely low, de minimis levels, even in the presence of substantial smoking activity, and (b) that such smoking activity has a negligible effect on contaminant levels in buildings where smoking is unrestricted. (3-1087)

RJR concludes:

> RJR believes, based on its own detailed research and the consistent results of other workplace assessments, that a properly designed and maintained HVAC system that is operated in accordance with the ventilation rate procedures of the ASHRAE Standard 62-1989, will be effective in assuring that exposures to ETS will be de minimis.

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Based on their own case studies, the National Energy Management Institute (NEMI) acknowledges that exposure "to the odor caused by excessively high concentrations of ETS can be annoying to nonsmokers." NEMI suggests that "several avenues exist to address this problem. First and foremost is to apply the ASHRAE 62-1989 ventilation standard . . . workplaces operating in accordance with ASHRAE 62-1989 will not have ETS annoyance problems because the ventilation system will effectively remove all smoke." (3-1183)

In their comprehensive review of indoor air quality in non-industrial occupational environments, Morey and Singh write that "ASHRAE Standard 62-1989 is probably the most important document in the IAQ literature."[27] (Morey, 3-505) They note:

> It reflects a consensus reached since 1983 by knowledgeable individuals from engineering, industrial and academic groups. Janssen points out that the ventilation rates recommended in Standard 62-1989 for the most part are similar to 'recommended' rates in Standard 62-1973 and to the rates recommended for smoking environments in Standard 62-1981.
>
> A key feature of Standard 62-1989 and its ventilation rate procedure is the increase in the minimum outdoor ventilation rate from 5 to 15 cfm per person. Outdoor air requirements recommended by the ventilation rate procedure make no distinction between 'smoking-allowed' and 'smoking-prohibited' areas. A minimum of 15 cfm of outdoor air per person as specified in the ventilation rate procedure is recommended because new research indicated that this is the minimum amount of outdoor air needed to dilute body and tobacco smoke odors to acceptable levels. The outdoor air

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requirements specified in the ventilation rate procedure must be delivered to the occupied zone. Design assumptions with regard to ventilation rates and air distribution to the occupied zone are required by Standard 62-1989.

Standard 62-1989 also requires that the design documentation for a HVAC system state clearly which assumptions are used in design. This allows others to estimate the limits of the HVAC system in removing air contaminants prior to commissioning and prior to the introduction of new contaminant sources into the occupied space.

A key provision in Standard 62-1989 now requires that when the supply of air to the occupied zone is reduced (for example, in VAV systems), provision be made to maintain minimum flow rates of outdoor air throughout the occupied zone.

Summary

OSHA's contention that ETS cannot be addressed through ventilation parameters (or indeed through its own Proposed Rule for IAQ and the proper operation and maintenance of ventilation systems) is not supported in the scientific literature. OSHA's position contradicts well-accepted practice that demonstrates the effectiveness of ventilation parameters in addressing complaints about, and exposures to, ETS. A workplace that is ventilated according to OSHA's Proposed Rule on IAQ, i.e., for the reduction of levels of indoor substances associated with sick-building syndrome complaints will also significantly dilute constituents and reduce and minimize exposures to ETS. Case reports and published scientific studies support this position.

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OSHA's refusal to endorse ASHRAE Standard 62-1989's ventilation rate procedures contradicts the specifications in its own Proposed Rule on IAQ, i.e., "that employers maintain and operate the HVAC system to provide at least the minimum outdoor air ventilation rate . . . required by the applicable building code . . . in effect at the time the facility was constructed, renovated and remodeled." (Emphasis added). 59 Fed Reg. 16026. ASHRAE Standard 62-1989 has served as the ventilation criteria document for new and renovated construction in the U.S. since 1990. (It is therefore part of OSHA's own Proposed Rule on IAQ).

OSHA's denial that a general, ventilation-based standard for IAQ is also applicable to ETS forces OSHA to an unsupported, untenable and contradictory position. Virtually every substance in the indoor air imputed to ETS by OSHA is also generated by other sources. In effect, OSHA argues that substance "X" can be addressed effectively through ventilation, unless precisely the same substance at precisely the same exposure level originates from ETS. 59 Fed Reg. 15979-80, 15984, 15985, 15987-88. OSHA obviously has no basis for this position.

OSHA's strategy regarding the alleged ineffectiveness of ventilation with relation to ETS is transparent. First, the position permits OSHA to pursue two separate lines of rulemaking for indoor air quality. This appears to satisfy the demand of

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Action on Smoking and Health (ASH), an anti-smoking organization, which seeks to force OSHA to separate ETS from the larger issue of IAQ and devote a regulation solely to workplace smoking. (See: ASH v. OSHA, 1992).

The bifurcated rulemaking for IAQ and ETS also permits OSHA to give the appearance of satisfying the technological/economic feasibility argument for its ETS standard. A ban on smoking in the workplace, OSHA argues, will cost nothing, and the provision of a separately ventilated smoking area is "an option, not a requirement, under the proposed regulation." 59 Fed Reg. 16013. On the other hand, if ETS were included among the ventilation-based provisions of OSHA's IAQ standard, the technological/economic feasibility of addressing ETS would become part of the IAQ standard, now estimated by OSHA to cost approximately $8 billion. The technical and economic feasibility of dealing with ETS would then stand or fall with the entire IAQ standard, something OSHA appears unwilling to risk in its quest to completely "eliminate the nonsmoker's exposure to ETS." 59 Fed Reg. 16016.

OSHA also apparently recognizes that its specific recommendation to eliminate ETS in the workplace would not be legally supportable under a generic IAQ standard based on ventilation. A smoking ban or the restriction of smoking to an

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enclosed room, under a generic ventilation-based IAQ standard that included ETS, would result only in insubstantial and insignificant reductions in exposures to ETS beyond basic (adequate) ventilation. The U.S. Supreme Court has determined that OSHA may only seek to eliminate "significant risks" and may not pursue the "regulation of insignificant risks." (See: API v. IUD, 64651.)

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